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XLIII. *Observations of the Transit of Venus over the Sun, contained in a Letter to the Reverend Nevil Maskelyne, Astronomer Royal, from Dr. Alexander Wilson, Professor of Astronomy in the University of Glasgow.*

College, Glasgow, Sept. 9, 1769.

S I R,

Read Dec. 7, 1769. **I** SEND you now the particulars of my observation of the transit of Venus, together with the observations of those who acted in concert with me. I chose for the place of my observations a house at some distance from our observatory, but in sight of it, and more free from the smoke of the town; where I had two gentlemen to attend the clock, and mark the times. I carried with me two reflectors of Mr. Short's, which are described below. Three other instruments were made use of at the observatory; the first was an achromatic tube of Dollond's, 29 inch focus, by which an image of the Sun was formed, of about six inches diameter, on a board covered with paper. The telescope being mounted upon a frame, by which it could be turned about as the Sun moved, and the room properly darkened. This instrument was managed by Dr. Williamson
and

and Dr. Reid, at the west window of the room of the observatory, wherein the astronomical clock stood ; the other two instruments were placed without, at the south and north windows of the same room, one being a refractor of 13 feet, by which Dr. Irvine observed ; the other a 12 inch reflector of Short's, by which my son observed. These two observers looked directly at the Sun, having their instruments armed with smoke-glasses ; another person stood at the clock, and counted the seconds by coincident beats upon a piece of board, which he held in his hand for that purpose, and who named every fifth second, so that all the observers could hear him distinctly. The motion of the clock, made by Shelton, was carefully adjusted by many transits of the Sun and fixed stars, over the meridian, both before and after the day of the transit ; the clock by which my observations were made was adjusted by Shelton's, by means of signals made every hour, for some hours before and after the transit. It was apprehended, that the smoke of the town might hurt the observations ; and, to prevent this as much as possible, an advertisement was put in the news-paper, begging the inhabitants, in cases where it would not be very inconvenient, to put out their fires from three o'clock that afternoon till sun-setting ; the politeness of the inhabitants of Glasgow, in complying with this request, was far greater than could well be expected, insomuch that there was not a spire of smoke to be perceived in that quarter from which the observations could be incommoded. Having made these preparations, we thought we had nothing to fear but the clouds ; and indeed the western part of the heavens was covered
with

with thick clouds all the afternoon, till a short time before the external contact; but they drove away towards the north, and left the Sun perfectly bright, excepting that now and then a cloud passed over him. But we soon found that the constitution of the air was otherwise unfavourable to our observations; the image of the Sun on the white board, made by the achromatic telescope, was bright enough; but there was a remarkable undulation in the limb, which could be owing to nothing else but the state of the air. This inconvenience was also sensibly felt both by the other gentlemen and myself. Besides the undulation now mentioned in the limb of the Sun, there was also a considerable tremor round the planet Venus, when she was seen upon the Sun's disc, and, in consequence of this, an indistinctness in her limb, which made it impossible to measure her diameter by our object glass micrometer, or otherwise. After the center of Venus had passed the Sun's limb, she appeared to us not to be circular, but oblong, the longest diameter being that which passed through the Sun's center. As the internal contact approached, Venus appeared to us to adhere to the Sun's limb, by a dark protuberance or neck, both the length and breadth of which varied every moment by a constant undulation: neither did this neck break off instantaneously, but changed its colour from black to a dusky brown, till at last the interval betwixt Venus and the Sun's limb appeared quite clear. Each of the observers wrote down his observations on the spot. I reduced them, together with my own, to apparent time, from the observations I had

had made on the going of the clock, and are as follows :

		h	'	"
By Doctor Wilson.	External contact	6	54	31,4
	Venus's center judged to be on the limb	7	1	33,4
	Sun's light appeared betwixt Venus and the limb	7	11	56,7
	<hr/>			
	The beginning of the Solar eclipse next morning, observed by Short's 18 inch reflector	18	30	14,2
	Middle, from a series of observations with the object glass micrometer, fitted to a nine inch reflector of Short's	19	18	47,7
	End not visible	<hr/>		
By Dr. Wil- liamson and Dr. Reid.	External contact	6	54	28
	Internal contact, or when the Sun's light appeared betwixt Venus and the limb	7	12	24
	Venus's center judged to be on the limb, by Dr. Reid	7	1	24

Dr. Reid marked the time when he conceived the internal contact would have happened, if the dark protuberance upon Venus had been taken away, and her disc reduced to a circle, viz. $7^h 10' 24''$.—He thinks it likewise proper to mention, that, several seconds before the time above set down as the time of the internal contact, he saw a small dint upon the Sun's limb, which he took to be the external contact; that he immediately mentioned this to Dr. Williamson, who happened that instant to have his eyes turned another way; but before he could look at it, it disappeared by the undulation in the Sun's limb. Dr. Reid is the more persuaded that this was not mere imagination, because this dint on the limb of the Sun appeared to him much nearer to the Sun's vertical

vertical diameter than he expected it, but in the very point, however, where it was clearly seen immediately after.

		h	'	"
P. Wilson.	{	External contact	6	54 28
		Internal contact	7	12 24

My son desires me to remark, that his first observation should be considered as no other but a posterior confirmation of Dr. Williamson's and Dr. Reid's external contact; the fact was, that when these gentlemen perceived the first contact, their keenness made them call out, and it was not till then that he saw the phenomenon with perfect certainty. He was conscious, however, that he fluctuated concerning the reality of the appearance for about twelve seconds before that time, during which his determinations were suspended, through an apprehension of anticipating the real time, which was heightened by so close a neighbourhood with the other observers, all of whom he could not help being sensible were still expecting the phenomenon. Upon the whole, he is rather of opinion that he would have put down the external contact at least eight seconds sooner had he been observing apart. His second observation, by which he means the instant when the interval between Venus and the Sun's limb first appeared obvious, was taken down without the least knowledge of what was passing among the other gentlemen who observed. Dr. Irvine has been out of town for some considerable time past, and forgot to lodge his observations with me, but I remember certainly that he made the external contact three seconds sooner than the rest; but his internal contact was some seconds

later, but how many I do not now remember. Mr. Anderson, F.R.S. fitted up a clock and apparatus in the college steeple; his clock was regulated as above, by signals from the observatory; he observed the transit with a large reflector, and his assistants observed with refractors: they were all of them uncertain about the external contact, owing to the state of the atmosphere, and a tremor given to the steeple by the wind; but none of their other observations varied, above three seconds, from my own, as related above.

	°	'	"	
Latitude of the observatory	55	51	32	
Longitude by corresponding observations	0	17	11	of time from Greenwich W.

I am, S I R,

with great esteem,

Your most obedient servant,

Alexander Wilson.

I have observed, during the course of this year, several times, the Aurora Borealis form itself into an arch, 20 or 30 degrees above the horizon, which continued permanent for some time; and in this case the vertex of the arch appeared always to be west from north, by about the variation of the needle in 19 or 20 degrees. Whether or not it is always so, I cannot yet say.